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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Richard E. Aufranc Jr. et al.	**Confirmation No.: 2349**
Application No.: 10/693,287	**Examiner: SIM, Yong H.**
Filing Date: October 23, 2003	**Group Art Unit: 2629**

Title: Display System for an Interlaced Image Frame with a Wobbling Device

Mail Stop Appeal Brief - Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF REPLY BRIEF

Transmitted herewith is the Reply Brief with respect to the Examiner's Answer mailed on November 26, 2008 .

This Reply Brief is being filed pursuant to 37 CFR 1.193(b) within two months of the date of the Examiner's Answer.

(Note: Extensions of time are not allowed under 37 CFR 1.136(a))

(Note: Failure to file a Reply Brief will result in dismissal of the Appeal as to the claims made subject to an expressly stated new ground rejection.)

No fee is required for filing of this Reply Brief.

If any fees are required please charge Deposit Account 08-2025.

Respectfully submitted,
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REPLY BRIEF

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Sir:

This is a Reply Brief under Rule 41.41 (37 C.F.R) in response to the Examiner's Answer of November 26, 2008 (the "Examiner's Answer" or the "Answer"). In Section 10, the Answer contains a response to some of the arguments made in Appellant's brief. Appellant now responds to the Examiner's Answer as follows.

Status of Claims

Claims 1-50 are pending in the application and stand finally rejected. Accordingly, Appellant appeals from the final rejection of claims 1-50, which claims are presented in the Appendix of the previously presented Appeal Brief.

Grounds of Rejection to be Reviewed on Appeal

The final Office Action raised the following grounds of rejection.

(1) Claims 1-4, 10-12, 17-22, 28-30, 35-38 and 44-46 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of U.S. Patent App. Pub. No. 2003/0090597 to Katoh et al. ("Katoh") and U.S. Patent No. 6,407,726 to Endo et al. ("Endo").

(2) Claims 5, 23 and 39 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Katoh, Endo and U.S. Patent No. 6,680,748 to Monti ("Monti").

(3) Claims 6-9, 13-16, 24-27, 31-34, 40-43 and 47-50 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Katoh, Endo and U.S. Patent No.5,581,302 to Ran et al. ("Ran").

According, Appellant hereby requests review of each of these grounds of rejection in the present appeal.

Argument

(1) Claims 1-4, 10-12, 17-22, 28-30, 35-38 and 44-46 are patentable over Katoh and Endo:

The Examiner's Answer misconstrues and confuses the technology at issue in this application and in the cited prior art. One principal issue is the concept of "wobulation," which the Examiner's Answer refuses to understand. Those who have skill in this art know that wobulation was actually invented by Hewlett-Packard Co., whose application this is. (See, http://www.ultimateavmag.com/news/042905hesw/).

Appellant has cited, by way of example, the definition of wobulation provided by Wikipedia.org.

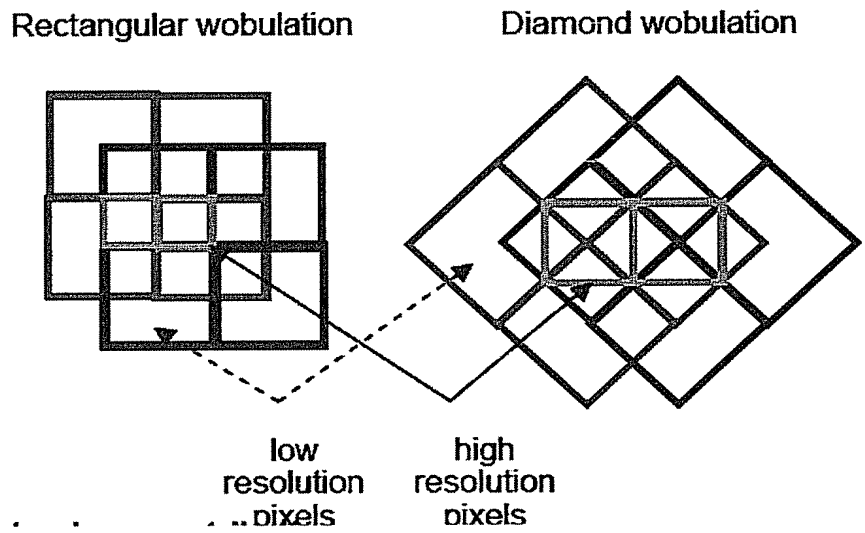
> Wobulation works by overlapping pixels. It does so by generating multiple sub-frames of data while an optical image shifting mechanism (e.g. the mirror of a digital micromirror device) then displaces the projected image of each sub-frame ***by a fraction of a pixel (e.g. one-half or one-third)***. ... *Thus a lower resolution fixed pixel device using wobulation can emulate the picture of higher resolution fixed device*, at a reduced cost.

(Wikipedia.org, "wobulation") (emphasis added) (see also, Appellant's specification, paragraph 0024).

Still refusing to understand wobulation, the best response the Examiner's Answer has to this is to argue that Wikipedia does not represent the "art-recognized" definition of wobulation. "Examiner respectfully asserts that the definition of 'wobulation' from Wikipedia can not be considered to be 'art-recognized.'" (Answer, p. 18). This is merely sticking one's head in the sand.

Referring to other sources,

> "Wobulation" is a breakthrough method of increasing the resolution of digital projection systems using a low-cost relatively low resolution SLM. Multiple low-resolution sub-frames of data are generated from each hi-resolution frame of image data. An optical image shifting mechanism displaces the projected image of each sub-frame by a non-integral number of pixels. The sub-frames are projected in rapid succession so as to appear as if they were projected simultaneously and superimposed.



(http://www.hpl.hp.com/personal/Niranjan_Damera-Venkata/wobulation.html?jumpid=reg_R1002_USEN).

Another public source defines wobulation as

> A technology from HP that increases the native resolution of front and rear-projection TVs. For example, Wobulation can generate a 1920x1080 resolution using a 1280x1024 DLP chip. It creates subframes out of each frame and uses a shifting mechanism to offset one subframe ***by a partial pixel***. Subframes are displayed one after the other so rapidly that they blend together as if they were displayed at once.

(http://encyclopedia2.thefreedictionary.com/Wobulation) (emphasis added).

Appellant could cite many more examples. However, it should be perfectly clear that it is only willful ignorance that allows the Examiner's Answer to construe Katoh as teaching a form of wobulation. As demonstrated on this record, Katoh has nothing to do with wobulation.

This is important to Appellant's claims because the key aspect of the definition of "wobulation" is incorporated directly into Appellant's claims. For example, claim 1 recites "a wobbling device configured to displace said light beam such that each of said image sub-frames is spatially displayed offset from a previous image sub-frame by *an offset distance less than a pixel width.*" (Claim 1).

According to the Answer, the "Appellant primarily argues [citation omitted] that Katoh does not teach 'wobulation' as defined in Wikipedia." (Answer, p. 19). This is incorrect. Appellant has demonstrated that Katoh does not teach wobulation as defined in Wikipedia, as commonly understood in the art and as expressly defined in the claims at issue.

As Appellant has previously noted, the Katoh technique does involve shifting or displacing sub-frames of a projected image, as occurs in wobulation. However, wobulation is more that merely shifting sub-frames. As noted above, "wobulation" requires displacing "the projected image of each sub-frame ***by a fraction of a pixel (e.g. one-half or one-third)*** ... [so that] a lower resolution fixed pixel device using wobulation can emulate the picture of higher resolution fixed device." (Wikipedia.org, "wobulation").

In contrast, Katoh teaches that shifting is always ***by an integer pixel amount*** such that two different colors are projected to a single pixel to produce a blended color result for that pixel. (Katoh, paragraph 0041). This increases the color range of the display device. (Katoh, paragraphs 0155-6) (emphasis added).

According to the Answer, the "Examiner respectfully assert that Katoh teaches a system which shifts image sub-frames to increase the resolution of the image just as the Appellant described." (Answer, p. 19). This is unreasonable. ***How can shifting pixels only by an integer amount, i.e., completely overlapping one pixel with another, "increase the resolution of the image" as asserted in the Answer? It can't.*** The result is only the same number effective pixels in the display. The purpose of this shifting taught by Kato is to produce a blended color, not increased resolution. This is clearly explained by Katoh. (Katoh, paragraph 0041). The Examiner's Answer is absolutely incorrect when attempting to characterize Katoh as teaching some form of wobulation.

The Answer further argues that "Katoh clearly shows in Fig. 7, how the display subframes are shifted/wobbled to increase the resolution of the display." (Answer, p. 19). This is, again, a clear mischaracterization of Katoh. Fig. 7 of Katoh shows the blending of blue, green and red pixels to form a white pixel. Fig. 7 has *nothing* to do with an increase in the resolution of the display. The Answer repeatedly confuses color blending with increasing resolution. One of skill in the art would never see in Katoh the mischaracterized teachings alleged by the Examiner's Answer.

Katoh has nothing to do with wobulation.

As Appellant has previously noted, the Endo reference does describe a wobulation system, but does not teach or suggest the wobulation system recited by the Appellant. As demonstrated above, the Examiner's Answer assumes incorrectly that the teachings of Endo regarding wobulation are relevant to the teachings of Katoh. Once it is understood that Katoh does not teach or suggest a wobulation system, the proposed combination of teachings from Katoh and Endo is clearly unreasonable and would not have been considered by one of skill in the art who would understand that Katoh has nothing to do with wobulation.

The Answer argues, in response, that "the combination of Katoh and Endo are appropriate since Katoh and Endo both teach shifting images to improve resolution of the display device." (Answer, p. 21). To the contrary, as Appellant has clearly demonstrated herein, Katoh does not teach or suggest improving resolution of the display device. Clearly, the Examiner's Answer misunderstands the prior art to Katoh and, consequently, proposes a combination of teachings that would be utterly unreasonable to one of skill in the art. For at least these reasons, the rejection based on Katoh and Endo should not be sustained.

Claim 1:

Even if Katoh and Endo could reasonably be combined as proposed by the Examiner's Answer, which they cannot, the claimed subject matter still falls well outside the scope and content of such prior art. Claim 1 recites:

> A display system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising:
>
> an image processing unit configured to process a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and generate a number of image sub-frames;
>
> a modulator configured to generate a light beam bearing said number of image sub-frames; and
>
> a wobbling device configured to displace said light beam such that each of said image sub-frames is spatially displayed offset from a previous image sub-frame by an offset distance less than a pixel width;
>
> w*herein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field.*

(Emphasis added).

In contrast, Katoh and Endo do not teach or suggest the claimed display system, "wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field." This subject matter is entirely outside the scope and content of the cited prior art.

Appellant's claim 1 recites a new relationship between the fields of an interlaced video signal and the sub-frames generated *for wobulation*. Specifically, rather than converting the interlaced video to progressive video so that it can be processed similar to any other image frame, claim 1 recites that at least one image sub-frame is formed using only data from a specific, i.e., top field, of an image frame and another at least one image sub-frame is formed using only data from a specific, i.e., bottom field, of the image frame. The cited prior art does not remotely suggest this subject matter.

On this point, the Examiner's Answer again cites Katoh at paragraphs 0174 and 0176. (Action, p. 3). These paragraphs talk about how the Katoh's color blending system could be implemented with interlaced video. In context, the cited portions of Katoh state the following:

> [0174] It should be noted that if the panel 8 is driven by an interlaced scanning technique, the scan lines on the screen are grouped into even-numbered lines and odd-numbered lines. In the interlaced scanning, either all of these even-numbered scan lines or all of these odd-numbered scan lines are alternately activated. Accordingly, T={fraction (1/30)} second.apprxeq.33.3 milliseconds. Also, the time allotted to each of the even- and odd-numbered fields that make up one frame (i.e., one field time period) is {fraction (1/60)} second.apprxeq.16.6 milliseconds. ...
>
> [0176] For example, suppose an image represented by a frame (i.e., an image frame) is as shown in (a) of FIG. 4. This image frame should be displayed in full colors, and the colors of the respective pixels are determined in accordance with the data defining this image frame. It should be noted that in the interlaced scanning technique, an image represented by a field may be processed similarly to an "image frame" as used herein.
>
> [0177] The conventional three-panel projection type image display device separates the data into three data subsets corresponding to the R, G and B light rays for the respective pixels, thereby generating three data subsets representing the R, G and B image frames as shown in (b), (c) and (d) of FIG. 4. ...
>
> [0179] ***In contrast, unlike any of these conventional techniques, the single-panel projection type image display device of this preferred embodiment sequentially illuminates the same area on the projection plane 13 with the R, G and B light rays that have been modulated by mutually different pixel regions of the single image display panel 8, thereby forming a pixel on that same area. That is to say, taking an arbitrary pixel on the projection plane 13, the pixel is displayed by a method similar to the known field sequential technique. However, the method of this embodiment is entirely different from the conventional field sequential technique in that the R, G and B light rays that make up one pixel have been modulated by mutually different pixel regions of the single image display panel.*** FIG. 5(c) schematically shows how the R, G and B light rays that are irradiated time-sequentially are combined for a particular pixel on the projection plane 13 in one frame period. The three images shown on the left-hand side of FIG. 5(c) correspond to the three mutually different image subframes produced by the single image display panel 8.

(Emphasis added).

Thus, the cited portions of Katoh merely mention interlaced video in the context of the color blending technique of Katoh. This has absolutely nothing to do with wobulation or Appellant's claimed subject matter.

Katoh does not teach or suggest the claimed "display system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising ... wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field." As Appellant has previously explained, the Endo reference similarly does not teach or suggest this subject matter. Thus, it is unreasonable to suggest that Katoh and Endo render claim 1 obvious.

Finally, Appellant notes that claim 1 recites "wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field." The Examiner's Answer and previous office actions have never shown how or where the cited prior art teaches this specific subject matter, i.e, that one wobulation sub-frame is generated using only pixel data in the top field of an interlaced image frame and another is generated using only pixel data in the bottom field of the interface image frame. This subject matter is clearly beyond the scope and content of the cited prior art.

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present case, the scope and content of the prior art, as evidenced by Katoh and Endo clearly did not include Appellant's claimed display system

including a wobbling device that wobbulates successive subframes "such that each of said image sub-frames is spatially displayed offset from a previous image sub-frame by an offset distance less than a pixel width ... wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field." This subject matter is entirely outside the scope and content of the cited prior art.

This difference between the cited prior art and the claimed subject matter is extremely significant. The prior art does not address or provide a technique for using wobulation with interlaced video. As demonstrated herein, Katoh teaches a color blending technique and mentions interlaced video, but the ability to use wobulation for increased resolution with interlaced video is not taught, enabled or available in the cited prior art.

For at least these reasons, Katoh and Endo will not support a rejection of Appellant's claims under 35 U.S.C. § 103(a) and *Graham*. Therefore, the rejection of Appellant's claims should not be sustained.

Claim 18:

Independent claim 18 recites:

> A method of displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said method comprising:
>
> processing a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and *generating a number of wobulation image sub-frames corresponding to said top and bottom fields*; and
>
> displaying each of said image sub-frames offset from a previous image sub-frame *by an offset distance less than a pixel width.*

(Emphasis added).

In contrast to claim 18, as explained above, the cited prior art, including Katoh and Endo, has not taught or suggested "generating a number of *wobulation* image sub-frames

corresponding to said top and bottom fields" of an interlaced image frame. This subject matter is entirely outside the scope and content of the cited prior art. Therefore, Katoh and Endo will not support a rejection of Appellant's claims under 35 U.S.C. § 103(a) and *Graham*, and the rejection of Appellant's claims should not be sustained.

Claim 36:

Independent claim 36 recites:

> A system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising:
>
> means for processing a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and *generating a number of wobulation image sub-frames corresponding to said top and bottom fields*; and
>
> means for displaying each of said image sub-frames offset from a previous image sub-frame *by an offset distance less than a pixel width.*

(Emphasis added).

In contrast to claim 36, as explained above, the cited prior art, including Katoh and Endo, has not taught or suggested "means for displaying each of said image sub-frames offset from a previous image sub-frame *by an offset distance less than a pixel width.*" To the extent Katoh is even relevant, it teaches away from this concept. Katoh further does not teach or suggest means for "generating a number of *wobulation* image sub-frames." As demonstrated above, Katoh has nothing to do with and does not mention wobulation. Katoh and Endo further fail to teach or suggest means for "generating wobulation image sub-frames for wobulation where the image sub-frames correspond to top and bottom fields of an interlaced image frame."

The Answer fails to respond to this additional argument regarding claim 36. In reality, this subject matter is entirely outside the scope and content of the cited prior art.

Therefore, Katoh and Endo will not support a rejection of Appellant's claims under 35 U.S.C. § 103(a) and *Graham*, and the rejection of Appellant's claims should not be sustained.

Claim 2:

Additionally, as would be expected, the various dependent claims of the application recite additional subject matter that is not taught or suggested by Katoh. For example, claim 2 recites "wherein said image processing unit is configured to process said pixel data elements in said top field to generate a first image sub-frame and said pixel data elements in said bottom field to generate a second image sub-frame."

In attempting to reject claim 2, the misguided Office Action cites a portion of Katoh (paragraph 0026) that describes the conventional method of generating sub-frames from a *non-interlaced* video frame. (final Office Action, p. 6). This teaching, however, is without reference or regard to the fields of an interlaced image frame. Consequently, the cited portion of Katoh clearly has nothing to do with the subject matter of claim 2.

In this regard, the Answer again argues that Katoh teaches that "each frame generates sub-frames for wobulation as indicated in Para 0026." (Answer, p. 23). This, however, has been demonstrated as completely incorrect above. Katoh has nothing to do with wobulation and clearly does not teach or suggest generating sub-frames for wobulation in paragraph 0026.

In sum, the cited prior art has not been shown to teach or suggest "wherein said image processing unit is configured to process said pixel data elements in said top field to generate a first image sub-frame and said pixel data elements in said bottom field to generate a second image sub-frame." This subject matter is entirely outside the scope and content of the cited

prior art. For at least these additional reasons, the rejection of claim 2 should not be sustained.

Claim 10:

Claim 10 recites:

> wherein said image processing unit is configured to:
> process said pixel data elements in said top field to generate a first image sub-frame and a second image sub-frame; and
> process said pixel data elements in said bottom field to generate a third image sub-frame and a fourth image sub-frame.

The response in the Answer to Appellant's arguments in favor of claim 10 amounts merely to the reiterated mistake that Katoh teaches that "each frame generates sub-frames for wobulation as indicated in Para 0026." (Answer, p. 24). This has been shown to be completely incorrect. Consequently, the rejection of claim 10 should not be sustained.

Katoh has nothing to do with wobulation and therefore does not contemplate, teach or suggest *four* image sub-frames generated from the top and bottom fields of an interfaced video frame. Thus, no *prima facie* case of unpatentability as to claim 10 has been made. For at least these additional reasons, the rejection of claim 10 should not be sustained.

Claim 12:

Claim 12 recites:

> wherein said image processing unit is further configured to:
> process every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame;
> process every other pixel data element in said top field starting with a second pixel data element in said top field to generate said second image sub-frame;
> process every other pixel data element in said bottom field starting with a first pixel data element in said bottom field to generate said third image sub-frame;
> process every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said fourth image sub-frame.

In contrast, as demonstrated above, none of the cited prior art references teach or suggest generating *four* different image sub-frames. With regard to claim 12, the Answer merely refers to the discredited reasons for rejected claim 10, above.

The specific starting points for the processing to generating each of the four sub-frames, as recited in claim 12, is not taught or suggested in the cited prior art. Consequently, no *prima facie* case of unpatentability as to claim 12 has been made. Moreover, the subject matter of claim 12 is clearly outside the scope and content of the cited prior art. For at least these additional reasons, the rejection of claim 12 should not be sustained.

(2) Claims 5, 23 and 39 are patentable over Katoh, Endo and Monti:

This rejection should not be sustained for at least the same reasons given above in favor of the corresponding independent claims.

Claim 5:

Additionally, claim 5 recites:

> wherein said image processing unit is further configured to:
> process every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame; and
> process every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said second image sub-frame.

With regard to claim 5, the final Office Action concedes that Katoh and Endo do not teach or suggest the claimed subject matter. (final Office Action, p. 13). Consequently, the final Office Action cites Monti as teaching "a spatial resolution reduction process wherein the pixel values in every other block are read out so as to perform a spatial resolution reduction by a factor of 2." (*Id.*) (emphasis in original). However, Appellant has previously

demonstrated that Monti's teachings regarding the "pixel values in every other block" have nothing to do with the claimed method of processing every other pixel data element in a top field and a bottom field, respectively, to produce first and second image sub-frames.

In response, the Answer argues that "one cannot show nonobviousness by attacking reference individually where the rejections are based on combinations of references." (Answer, p. 25). Likewise, obviousness cannot be shown by citing several disparate and irrelevant references and hoping that, in the confusion, teachings which are simply not in the prior art will somehow be implied. In such a case, no *prima facie* case of unpatentability has been made as to claim 5. Rather, the claimed subject matter is entirely outside the scope and content of the cited prior art. For at least these additional reasons, the rejection of claim 5 and similar claims 23 and 39 should not be sustained.

(3) Claims 6-9, 13-16, 24-27, 31-34, 40-43 and 47-50 are patentable over Katoh, Endo and Ran:

This rejection should not be sustained for at least the same reasons given above in favor of the corresponding independent claims.

Claims 6 and 13:

Additionally, claim 6 recites:

> wherein said image processing unit is further configured to:
> average every two neighboring pixel data elements in each line of said top field starting with first and second pixel data elements in each line of said top field to generate said first image sub-frame; and
> average every two neighboring pixel data elements in each line of said bottom field starting with second and third pixel data elements in each line of said bottom field to generate said second image sub-frame.

With regard to claims 6 and 13, the Answer again resorts to a non-substantive argument. The Answer again argues that "one cannot show nonobviousness by attacking reference individually where the rejections are based on combinations of references." (Answer, p. 26). Likewise, as Appellant noted above, obviousness cannot be shown by citing several disparate and irrelevant references and hoping that, in the confusion, teachings which are simply not in the prior art will somehow be implied. In such a case, no *prima facie* case of unpatentability has been made. For at least these additional reasons, the rejection of claim 6 and similar claim 13 should not be sustained.

Claim 8:

Claim 8 recites:

> wherein said image processing unit is further configured to:
> generate said first image sub-frame by computing a function of one or more pixel data elements in said top field; and
> generate said second image sub-frame by computing a function of one or more pixel data elements in said bottom field.

In contrast, none of the cited prior art references teach or suggest generating first and second image sub-frames by computing a function of one or more pixel data elements in respective top and bottom fields of interlaced video. No such teaching or suggestion has been demonstrated in the prior art. For at least these additional reasons, the rejection of claim 8 and any similar claims should not be sustained.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of 7 May 2008 is respectfully requested.

Respectfully submitted,

DATE: January 26, 2009

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